MERRIMACK RIVER BASIN
LAWRENCE, MASSACHUSETTS

STEVENS POND OUTLET DAM

MA 00232

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASSACHUSETTS 02154

AUGUST 1978

UNCLASSIFIED

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Lawrence, Massachusetts
Spicket River

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The dam appears to be in good condition. The "V" spillway is 90 ft. long with effective abutments of about 10 ft. on either end. The dam is about 15 ft. high at the abutments. Although the dam is in thesmall size category the hazard potential is extremely high and thus the situation was analyzed using the full probable maximum flood. A failure of the dam would overflow the left bank immediately below the dam, flood nearby buildings and streets.

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

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For use of this form, see AR 340-15, the proponent agency is TAGCEN.

REFERENCE OR OFFICE SYMBOL	SUBJECT
NEDED-W	Review of Non-Federal Dam Inspection Draft Report

TO: Chairman, Dam Safety Review Board

FROM: Chief, Water Control Branch

DATE: 15 September 1978

CMT 1

Mr. Manley/lab/540

NATIONAL PROGRAM OF INSPECTION OF NON-FEDERAL DAMS
DRAFT REPORT REVIEW COMMENTS
STEVENS POND OUTLET DAM, IDENTITY NO. MA 00232
WATER CONTROL BRANCH

Page	Comments
iii	At end of first paragraph add: "Also the massive granite black structure spans the width of the natural river channel with little chance of a large breach developing by erosion, if the dam is overtopped."
1	At end of paragraph 1.2.b. add: "The granite black structure and its short abutments span the width of the natural stream and it is bounded on both banks by streets and buildings. Therefore, there is little embankment area that could be subject to erosion during a major flood which exceeded the normal capacity of the spillway."

SARANDIS

STEVENS POND OUTLET DAM

MA 00232

MERRIMACK RIVER BASIN
LAWRENCE, MASSACHUSETTS

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

NATIONAL DAM INSPECTION PROGRAM

PHASE I INSPECTION REPORT

Identification No.:	MA 00232
Name of Dam:	Stevens Pond Outlet
Town:	Lawrence, Massachusetts
County and State:	Essex County, Massachusetts
Stream:	Spicket River
Date of Inspection:	June 15, 1978

BRIEF ASSESSMENT

Stevens Pond Outlet is an over 100-year old granite block dam of obvious quality of design and construction. It appears to be in good condition. The "V" spillway is 90 feet long with effective abutments of about 10 feet on either end. The dam is about 15 feet high at the abutments; freeboard between crest and abutments is 5 feet. The structure is founded on ledge rock.

The reservoir behind the dam is quite small, 7 or 8 acres. Both above and below the dam the river runs through a highly industrialized area in which there are numerous factories and dwellings. About two miles downstream the Spicket River joins the Merrimack River.

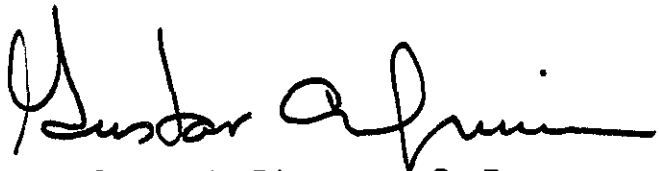
Although the dam is in the small size classification, the hazard potential is extremely high and thus the situation was analyzed using the full probable maximum flood.

The drainage area contributing to flow at the Stevens Pond Outlet is relatively large, over 40,000 acres, and provides a PMF of about 30,000 cfs. The small reservoir does not appreciably reduce this flow, thus a test flood of the same quantity was used to assess the effects. The spillway can only pass about 3,300 cfs, or 11 percent of the test flood, before overtopping occurs. Theoretically, assuming flow confined to the spillway and its abutments, the test flood would impose a 16-foot surcharge on the abutments. Actually, the river would overflow its banks and flood industrial and residential areas on either side. A failure of

the dam during such high flows would add little to the total flows as the dam would be at least partly submerged. Also the massive granite block structure spans the width of the natural river channel with little chance of a large breach developing by erosion, if the dam is overtopped.

A failure of the dam coincident with full spillway discharge could result in a flow of about 6,000 cfs which would overflow the left bank immediately below the dam, and flood nearby buildings and streets. Whether or not the remaining channel leading to the Merrimack River can safely carry 6,000 cfs cannot be determined readily.

Additional investigations or major modifications are not required. However, remedial measures that should be implemented by the owner within 24 months of the receipt of this Phase I Inspection Report are described in Section 7. The owner should implement inspection and maintenance procedures, make any needed repairs, clear the spillway discharge channel of growth and debris, and develop a flood warning system.



Gustav A. Diezemann, P. E.
New York State Lic. 027062

This Phase I Inspection Report on the Stevens Pond Outlet Dam has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgment and practice, and hereby submitted for approval.

CHARLES G. TIERSCH, Chairman
Chief, Foundation and Materials Branch
Engineering Division

FRED J. RAVENS, Jr., Member
Chief, Design Branch
Engineering Division

SAUL COOPER, Member
Chief, Water Control Branch
Engineering Division

APPROVAL RECOMMENDED:

JOE B. FRYAR
Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection, along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

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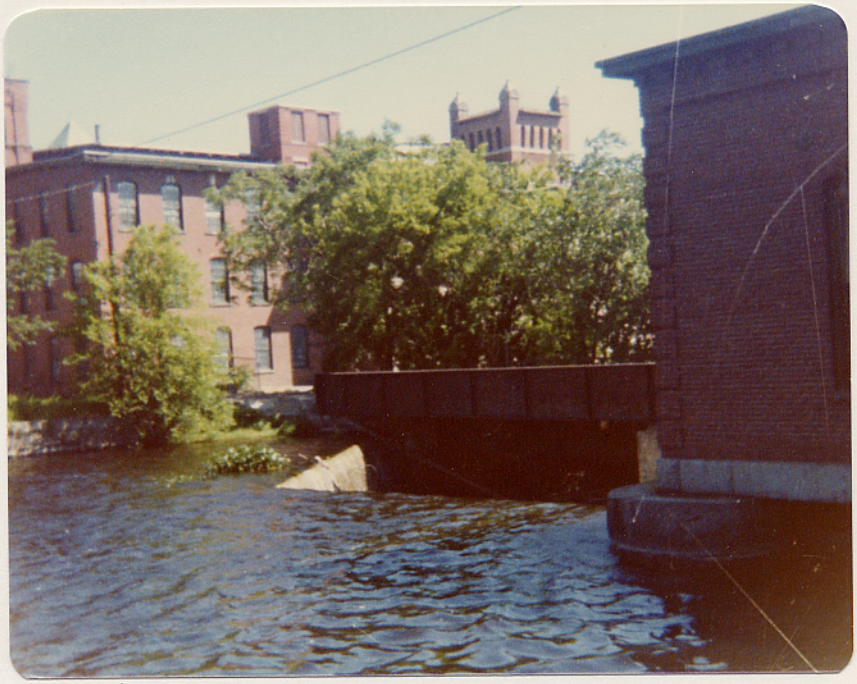
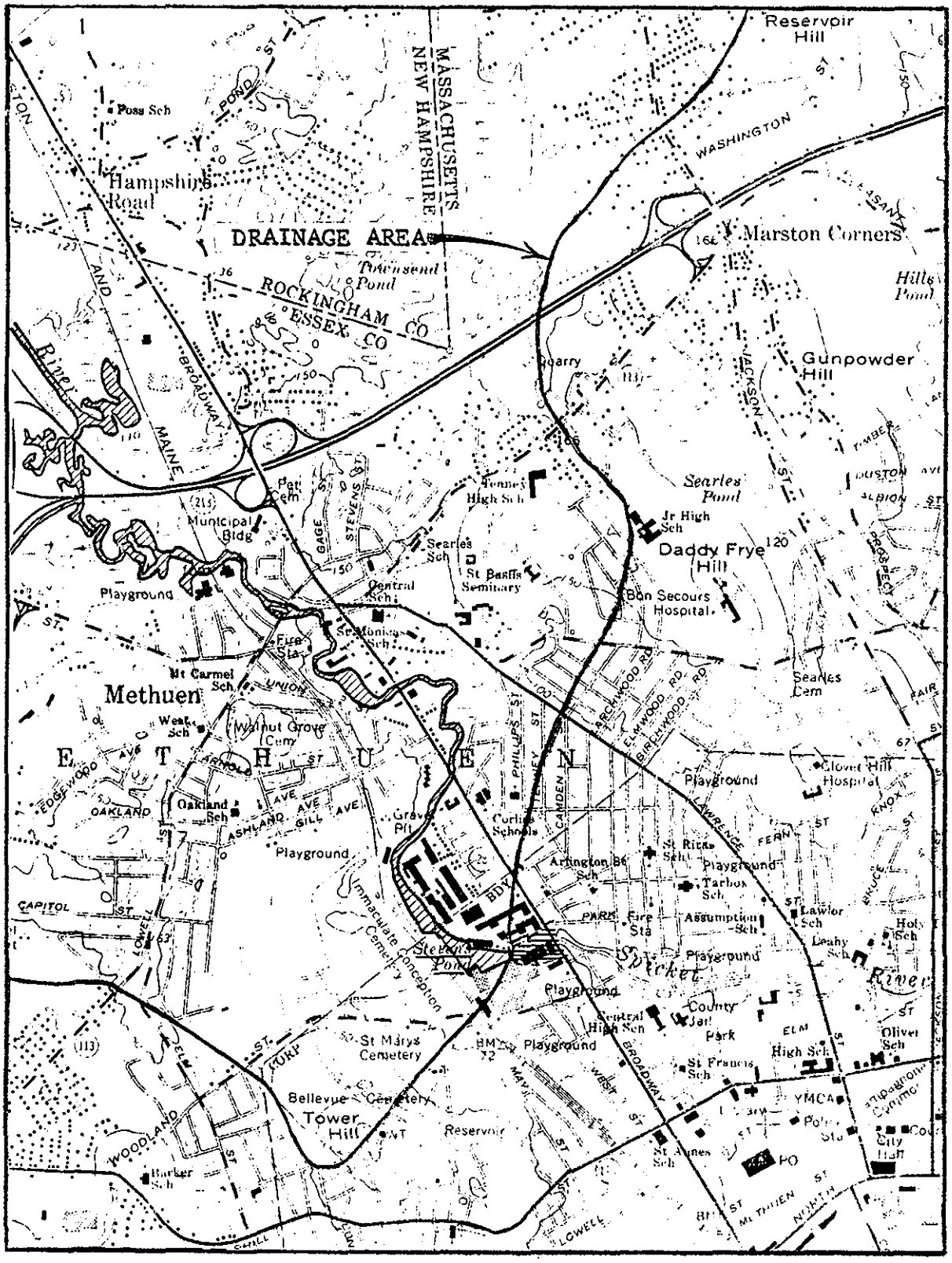


OVERVIEW PHOTO



STEVENS POND OUTLET

LAWRENCE, MASS. - N.H.
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PHASE I INSPECTION REPORT

STEVENS POND OUTLET

SECTION I

PROJECT INFORMATION

1.1 General

a. Authority. Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a National Program of Dam Inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Chas. T. Main, Inc. has been retained by the New England Division to inspect and report on selected dams in the State of Massachusetts. Authorization and notice to proceed were issued to Chas. T. Main, Inc. under a letter of May 3, 1978, from Ralph T. Garver, Colonel, Corps of Engineers. Contract No. DACW33-78-D328 has been assigned by the Corps of Engineers for this work.

b. Purpose.

(1) Perform technical inspection and evaluation of non-Federal dams to identify conditions which threaten the public safety and thus permit correction in a timely manner by non-Federal interests.

(2) Encourage and prepare the states to initiate quickly effective dam safety programs for non-Federal dams.

(3) To update, verify and complete the National Inventory of Dams.

1.2 Description of Project

a. Location. The Stevens Pond Outlet, on the Spicket River, is located in the Town of Lawrence, Essex County, Massachusetts.

b. Description of Dam and Appurtenances. The dam consists of a granite block overflow section 90 feet long. From bedrock to spillway crest is 10 feet. The freeboard is 5 feet. The outlet works are operable but are not used. The granite block structure and its short abutments span the width of the natural stream and it is bounded on both banks by streets and buildings. Therefore, there is little embankment area that could be subject to erosion during a major flood which exceeded the normal capacity of the spillway.

c. Size Classification. Owing to its impoundment of roughly 100 acre feet and its height of 15 feet, the dam falls within the small size classification.

d. Hazard Classification. As there are many factories and other structures downstream of the dam which would be endangered if the dam failed, the dam is considered to have a high hazard potential classification.

e. Ownership. The dam is owned by the Lawrence Industrial Association located at 550 Broadway in Lawrence, Massachusetts.

f. Operator. Mr. Robert Melanson, Higgins Avenue, Sandowne, New Hampshire, (603) 887-3882.

g. Purpose of Dam. The water impounded by the dam is used for industrial purposes. Water is taken from the pond about a half mile upstream of the dam.

h. Design and Construction History. Nothing is known of the design and construction history of the dam other than it was constructed in 1877.

i. Normal Operating Procedures. Apart from withdrawing water for industrial purposes and allowing the remainder to spill over the fixed crest, there are no operating procedures.

1.3 Pertinent Data

a. Drainage Area. The Stevens Pond has approximately 63 square miles of drainage area of varying nature.

b. Discharge at Damsite.

(1) The outlet works, consisting of two gated conduits, have been closed and are inoperable.

(2) The maximum known flood at the damsite is unknown.

(3) The ungated spillway capacity before the dam is overtopped is about 3,300 cfs, or approximately 11 percent of the test flood.

(4) There is no gated spillway capacity.

(5) There is no gated spillway capacity.

(6) The total spillway capacity at maximum pool, El. 68, is 3,300 cfs.

c. Elevation (Feet Above MSL)

(1)	Top of dam	El. 68 ±
(2)	Maximum design surcharge	El. 68 ±
(3)	Full flood control pool	N/A
(4)	Recreation pool	N/A
(5)	Spillway crest (gated)	El. 63 ± (assumed reference)
(6)	Upstream portal invert diversion tunnel	N/A
(7)	Streambed at centerline of dam	El. 53 ±
(8)	Maximum tailwater	El. 62 ±

d. Reservoir (Feet)

(1)	Length of maximum pool	5,000 ±
(2)	Length of recreation pool	N/A
(3)	Length of flood control pool	N/A

e. Storage (Acre-Feet)

(1)	Recreation pool	40 ± (at crest)
(2)	Flood control pool	N/A
(3)	Design surcharge	80 ±
(4)	Top of dam	80 ±

f. Reservoir Surface (Acres)

(1)	Top of dam	8 ±
(2)	Maximum pool	8 ±
(3)	Flood control pool	N/A
(4)	Recreation pool	N/A
(5)	Spillway crest	8 ±

g. Dam

(1)	Type	Granite block
(2)	Length	90 feet
(3)	Height	10 feet
(4)	Top Width	N/A
(5)	Side slope	N/A
(6)	Zoning	N/A
(7)	Impervious core	N/A
(8)	Cutoff	Unknown
(9)	Grout curtain	Unknown
(10)	Other	N/A

h. Spillway

(1)	Type	Ungated weir
(2)	Length of weir	90 feet
(3)	Crest elevation	El. 63 $\pm$
(4)	Gates	None
(5)	U/S Channel	N/A
(6)	D/S Channel	Stream bed
(7)	General	N/A

i. Regulating Outlets. The owner has stated that the outlet works are operable, but are no longer used.

SECTION 2

ENGINEERING DATA

2.1 Design

No design data are known to exist.

2.2 Construction

The Stevens Pond Dam was built in 1877. There are no detailed construction records available.

2.3 Operation

There is no formal operation of the dam. The fixed spillway crest controls the water level of the reservoir.

2.4 Evaluation

a. Availability. There are no engineering data available.

b. Adequacy. The lack of in-depth engineering data does not allow for a definitive review. Therefore, the adequacy of this dam, structurally and hydraulically, cannot be assessed from the standpoint of review of design calculations, but must be based primarily on the visual inspection, past performance history, and sound hydrologic and hydraulic engineering judgment.

c. Validity. N/A

SECTION 3

VISUAL INSPECTION

3.1 Findings

a. General. The Phase I visual inspection of the Stevens Pond Outlet Dam took place on June 15, 1978. The dam is located on the Spicket River in a highly industrialized area. The river is semi-channelized, the dam spanning what was probably most of the original river channel. The areas on either side of the dam are paved.

b. Dam. The over 100 year old dam is constructed on bed rock and is apparently in good condition. The granite block structure, although appropriately weathered, appears to be structurally sound. No significant horizontal or vertical misalignments were noticeable. Overflow prevents determining whether or not there is leakage through the joints. There is some growth at the left abutment and where the spillway joins the gate house on the right abutment.

c. Appurtenant Structures. The only appurtenant structure, the brick gate house, appears to be in good condition in spite of some growth in the joints. The outlet works are said to be operable, although seldom used.

d. Reservoir Area. There are several factories along the periphery of the reservoir and close to the water's edge. The reservoir is narrow and shallow and is well-silted as evidenced by the growth just upstream of the spillway lip. This light growth would obviously be washed away by any significant flow. There is no possibility of landslides or sudden increase of sediment in the reservoir.

e. Downstream Channel. Immediately downstream of the dam is a steel and concrete bridge spanning the river. While the left abutments of the bridge and dam are integral, the bridge would have little or no effect on the discharge capability of the spillway. Below the dam the river is semi-channelized and flows through highly industrialized and residential areas before it discharges into the Merrimack River about 2 miles downstream.

3.2 Evaluation

The visual inspection revealed a low, old, but obviously well-constructed dam founded on ledge rock. The dam and adjacent gate house are in good condition. The reservoir itself is not a factor in evaluating the dam. The effects of high flows in the channel between the dam and the Merrimack River cannot be determined within the scope of this investigation. It is obvious, however, that major flows would cause serious downstream problems.

SECTION 4

OPERATIONAL PROCEDURES

4.1 Procedures

Water is withdrawn from the pond well upstream of the dam.

4.2 Maintenance of Dam

There appear to be no regular procedures for maintaining the dam.

4.3 Maintenance of Operating Facilities

There appear to be no regular procedures for maintaining the outlet works.

4.4 Warning System

There is no warning system.

4.5 Evaluation

There appears to be a complete lack of definite operational procedures. Recommendations for improving these conditions are given in Section 7.3.

SECTION 5

HYDRAULIC/HYDROLOGIC

5.1 Evaluation of Features

a. Design Data. The hydraulic/hydrologic analysis was made in accordance with "Preliminary Guidance for Estimating Maximum Probable Discharges in Phase I Dam Safety Investigations", "Estimating Effect of Surcharge Storage on Maximum Probable Discharges", and "Rule of Thumb Guidance for Estimating Downstream Dam Failure Hydrographs" as furnished by the New England Division, Corps of Engineers and "Recommended Guidelines for Safety Inspection of Dams" as issued by the Department of the Army, Office of the Chief of Engineers.

U.S.G.S. Quadrangle maps were used to determine reservoir and drainage areas. Where practicable, spillway dimensions were obtained by direct measurement. Hydraulic coefficients were assigned on the basis of experience and engineering judgment.

b. Experience Data. No specific experience data with respect to the hydraulic/hydrological characteristics of the project are known to exist.

c. Visual Observations. This is a small, run-of-river project with virtually no storage. Industrial buildings surround the dam, both up and downstream. Large surcharges would probably not be confined to the dam and abutments, but would spread out through the buildings.

d. Overtopping Potential. A Probable Maximum Flood of 30,000 cfs was determined. Although the dam falls within the small size classification, the hazard potential is extremely high. The full PMF was used to determine the Peak Outflow (or test flood) which, owing to the very small reservoir area, is not measurably reduced from the PMF of 30,000 cfs. The spillway has the capability of discharging only 3,300 cfs before the abutments are overtopped.

If discharge is confined to the spillway and its short abutments, in the event of the test flood the abutments would be overtopped by some 16 feet. Actually, the river would leave its banks and flow around and through the various industrial and other structures on either side. In the river channel immediately downstream of the dam, the test flood would create an average water level of approximately El. 62. As this is only one foot below the spillway crest, the dam is effectively hydraulically submerged and a failure of the dam during the test flood would add little to the total flow.

The Peak Failure Outflow of 2,700 cfs, combined with the spillway discharge at full pond, results in a flow of about 6,000 cfs. As near as can be determined, the channel immediately downstream can carry only about 4,000 cfs before the left bank is overtopped and water flows around the industrial buildings and onto Broadway and other streets in Lawrence. From inspection of the U.S.G.S. Quadrangle maps, it cannot be determined whether or not the channel through the City between Broadway and the confluence of the Spicket and Merrimack Rivers is hydraulically capable of carrying 6,000 cfs.

The areas of potential impact are shown on the location map.

SECTION 6

STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations. Nothing was noted which would indicate that the dam is unstable.

b. Design and Construction Data. No design or construction data are known to exist.

c. Operating Records. Not applicable.

d. Post Construction Changes. No data concerning any post construction changes are known to exist.

e. Seismic Stability. The dam is located in Seismic Zone No. 2 and in accordance with recommended Phase I guidelines does not warrant seismic analysis.

SECTION 7

ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 Dam Assessment

a. Condition. The condition of this 100-year old granite block structure, founded on ledge rock, and its appurtenances appear to be good.

b. Adequacy of Information. The lack of in-depth engineering data did not allow for a definitive review. Therefore, the adequacy of this dam could not be assessed from the standpoint of reviewing design and construction data, but is based primarily on visual inspection, past performance history, and engineering judgment.

c. Urgency. The required repair and maintenance work should be accomplished within two years of receipt of this report by the owner.

d. Need for Additional Investigation. There is no need for additional investigation.

7.2 Recommendations

Additional engineering investigations or major modifications to the dam are not required.

7.3 Remedial Measures

a. Alternatives. Not applicable.

b. Operating and Maintenance Procedures. Presently required maintenance includes the repair of any loose or spalled concrete at the abutments and the general dressing-up of the facility. The owner of the dam should develop and implement procedures which would include:

(1) Continue periodic inspections on a bi-annual frequency and the initiation of repairs, as required.

(2) The channel between the dam and Broadway should be cleared, and kept clear, of growth and debris.

(3) Around the clock surveillance should be provided by the owner during periods of unusually heavy precipitation.

(4) The owner should develop a formal warning system with local officials for alerting downstream residents in case of emergency.

(5) The spillway should be inspected under a no-flow condition when possible.

APPENDIX A

VISUAL INSPECTION CHECK LIST
PARTY ORGANIZATION

PROJECT Stevens Pond Outlet

DATE 6/15/78

TIME 10:00 AM.

WEATHER Sunny & clear

W.S. ELEV. 57 U.S. ____ DN.S

PARTY:

1. J. Goodrich
2. D. Fischer
3. ____
4. ____
5. ____

	PROJECT FEATURE	INSPECTED BY	REMARKS
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

INSPECTION CHECK LIST

PROJECT STEVENS POND OUTLET DATE 6/15/78

PROJECT FEATURE _____ NAME _____

AREA EVALUATED	CONDITION
DIKE EMBANKMENT	
Crest Elevation	
Current Pool Elevation	
Surface Cracks	
Pavement Condition	
Movement or Settlement of Crest	
Lateral Movement	
Vertical Alignment	
Horizontal Alignment	
Condition at Abutment and at Concrete Structures	NOT APPLICABLE
Indications of Movement of Structural Items on Slopes	
Trespassing on Slopes	
Sloughing or Erosion of Slopes or Abutments	
Rock Slope Protection - Riprap Failures	
Unusual Movement or Cracking at or near Toes	
Unusual Embankment or Downstream Seepage	
Piping or Boils	
Foundation Drainage Features	
Toe Drains	
~~Instruments on System~~	

INSPECTION CHECK LIST

PROJECT STEVENS POND OUTLET DATE 6/15/78

PROJECT FEATURE _____ NAME _____

AREA EVALUATED	CONDITION
Granite ~~CONCRETE~~ DAM (Overflow Section)	
~~Concrete~~ Granite Surfaces	some spalling
Structural Cracking	none
Movement -- Horizontal & Vertical Alignment	none
Junctions	—
Drains -- Foundation, Joint, Face	—
Water Passages	—
Seepage or Leakage	Leakage thru gates
Monolith Joints -- Construction Joints	
Foundation	

INSPECTION CHECK LIST

PROJECT STEVENS POND OUTLET DATE 6/15/78

PROJECT FEATURE _____ NAME _____

AREA EVALUATED	CONDITION
OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE	
a. Approach Channel	NOT APPLICABLE
Slope Conditions	
Bottom Conditions	
Rock Slides or Falls	
Log Boom	
Debris	
Condition of Concrete Lining	
Drains or Weep Holes	
b. Intake Structure	GATE HOUSE
Condition of Concrete	FAIR
Stop Logs and Slots	NONE

INSPECTION CHECK LIST

PROJECT STEVENS POND OUTLET DATE 6/15/78

PROJECT FEATURE _____ NAME _____

AREA EVALUATED	CONDITION
OUTLET WORKS - TRANSITION AND CONDUIT	
General Condition of Concrete	
Rust or Staining on Concrete	
Spalling	
Erosion or Cavitation	NOT APPLICABLE
Cracking	
Alignment of Monoliths	
Alignment of Joints	
Numbering of Monoliths	

INSPECTION CHECK LIST

PROJECT STEVENS POND OUTLET DATE 6/15/78

PROJECT FEATURE _____ NAME _____

AREA EVALUATED	CONDITION
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	
a. Approach Channel	—
General Condition	—
Loose Rock Overhanging Channel	none
Trees Overhanging Channel	none
Floor of Approach Channel	—
b. Weir and Training Walls	
General Condition of Concrete	some spalling
Rust or Staining	none
Spalling	—
Any Visible Reinforcing	none
Any Seepage or Efflorescence	none
Drain Holes	none
c. Discharge Channel	
General Condition	—
Loose Rock Overhanging Channel	none
Trees Overhanging Channel	none
Floor of Channel	some debris & vegetation
Other Obstructions	

INSPECTION CHECK LIST

PROJECT STEVENS POND OUTLET DATE 6/15/78

PROJECT FEATURE _____ NAME _____

AREA EVALUATED	CONDITION
OUTLET WORKS - CONTROL TOWER	
a. Concrete and Structural	
General Condition	
Condition of Joints	
Spalling	
Visible Reinforcing	
Rusting or Staining of Concrete	
Any Seepage or Efflorescence	NOT APPLICABLE
Joint Alignment	
Unusual Seepage or Leaks in Gate Chamber	
Cracks	
Rusting or Corrosion of Steel	
b. Mechanical and Electrical	
Air Vents	
Float Wells	
Crane Hoist	
Elevator	
Hydraulic System	
Service Gates	
Emergency Gates	
Lightning Protection System	
Emergency Power System	
Wiring and Lighting System	

INSPECTION CHECK LIST

PROJECT STEVENS POND OUTLET DATE 6/15/78

PROJECT FEATURE _____ NAME _____

AREA EVALUATED	CONDITION
OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL	
General Condition of Concrete	
Rust or Staining	
Spalling	
Erosion or Cavitation	
Visible Reinforcing	NOT APPLICABLE
Any Seepage or Efflorescence	
Condition at Joints	
Drain holes	
Channel	
Loose Rock or Trees Overhanging Channel	
Condition of Discharge Channel	

INSPECTION CHECK LIST

PROJECT STEVENS POND OUTLET DATE 6/15/78

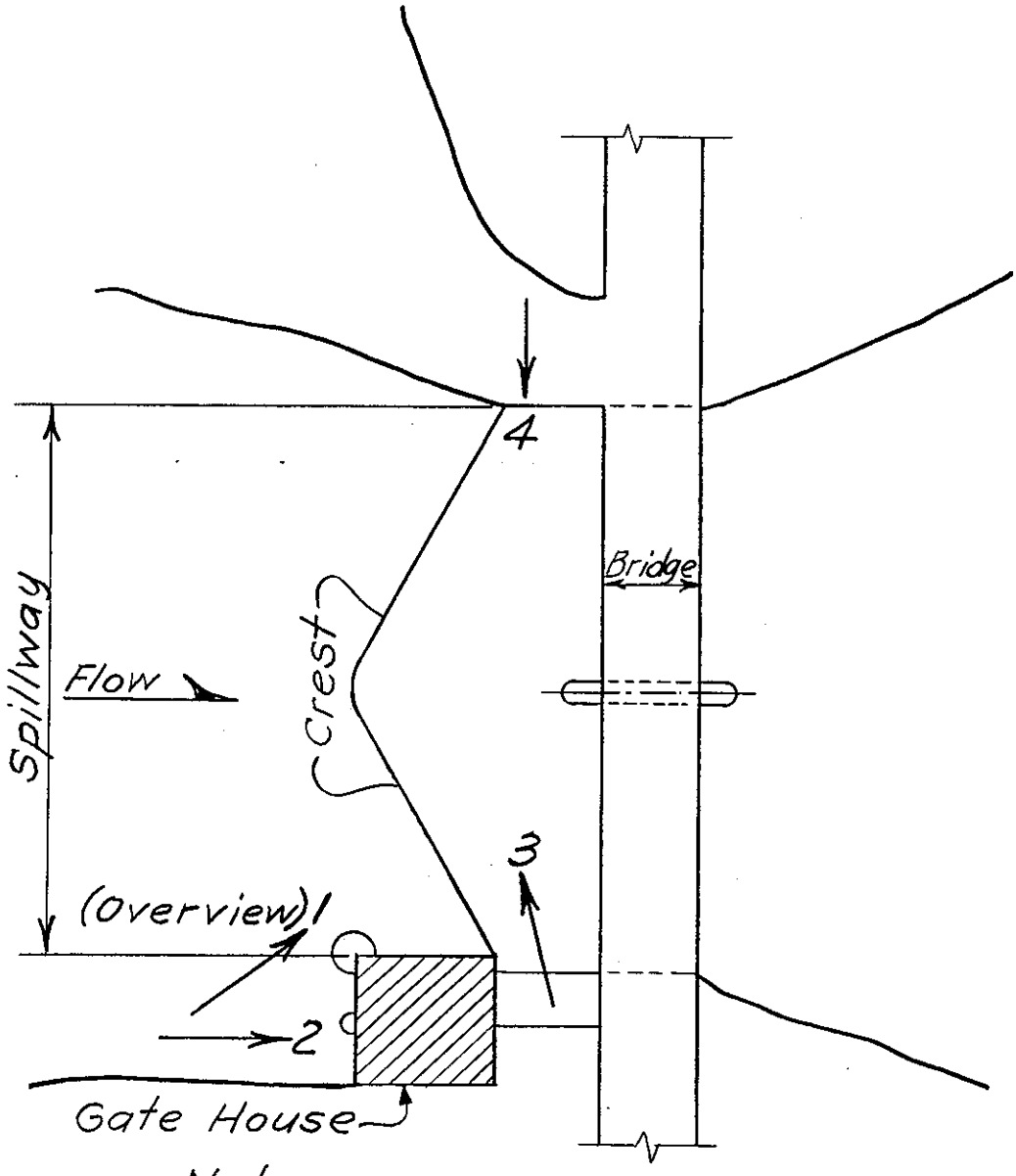
PROJECT FEATURE _____ NAME _____

AREA EVALUATED	CONDITION
OUTLET WORKS - SERVICE BRIDGE	
a. Super Structure	
Bearings	
Anchor Bolts	
Bridge Seat	
Longitudinal Members	
Under Side of Deck	NOT APPLICABLE
Secondary Bracing	
Deck	
Drainage System	
Railings	
Expansion Joints	
Paint	
b. Abutment & Piers	
General Condition of Concrete	
Alignment of Abutment	
Approach to Bridge	
Condition of Seat & Backwall	

APPENDIX B

No records of the design and construction of this project were located.

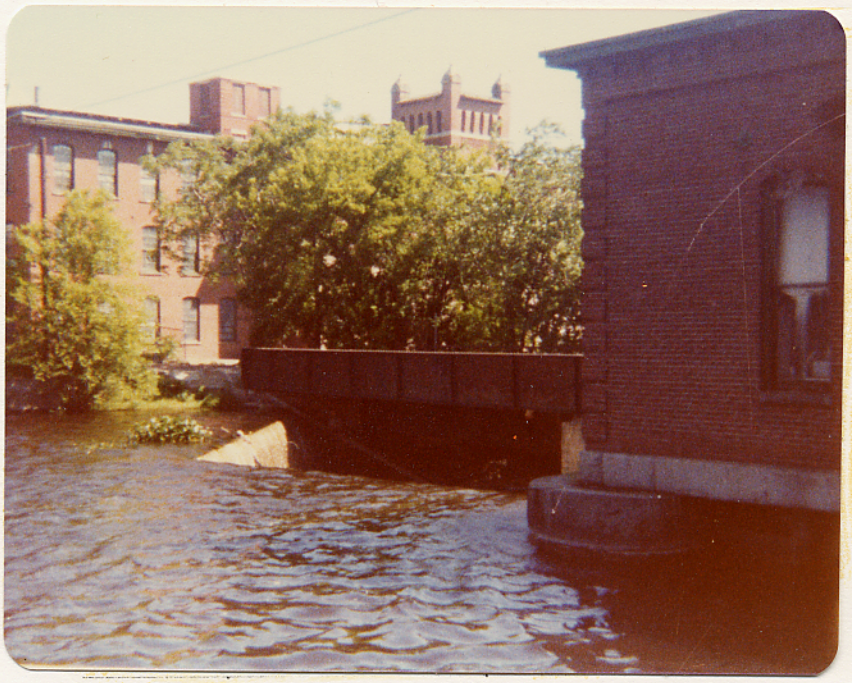
APPENDIX C



Note:
Nos. denote direction of Photos.

PLAN

STEVENS POND OUTLET



1

Upstream View of Spillway
from Right Bank

2

Upstream View of Gate House
from Right Bank

STEVENS POND OUTLET

3

Downstream View of Spillway
from Right Bank

4

Downstream View of Spillway
from Left Bank

APPENDIX D

Client C of E Job No. 1345-065 Sheet 1 of 6

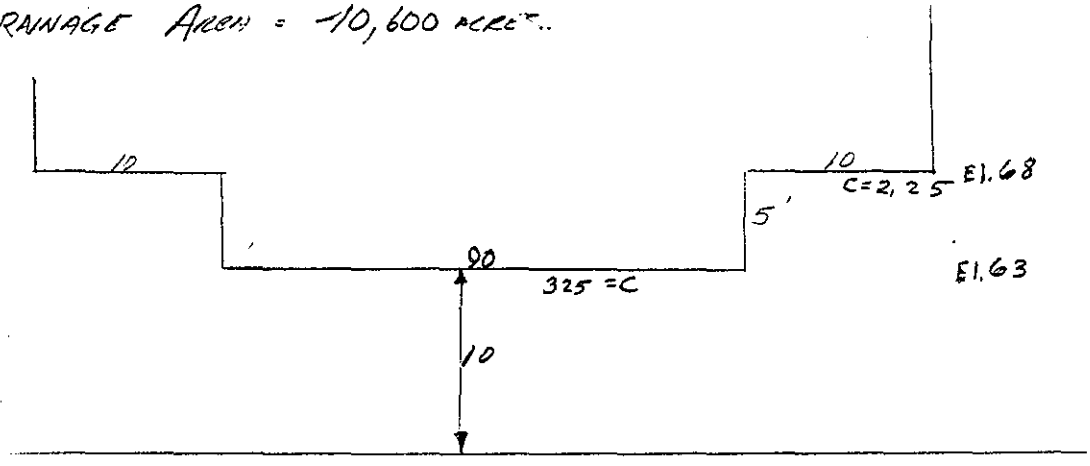
Subject STEVENS POND By J. VEITCH Date 8 AUG. 1979

Ckd. Rev.

PMF = 30,000 cfs.

RESERVOIR AREA = 7.5 ACRES.

DRAINAGE AREA = 10,600 ACRES.



$Q = CLH^{1.5}$

H	Q
1	290
3	1520
5	3270
6	4300 + 45 = 4345
8	6620 + 230 = 6850
10	9250 + 500 = 9750
12	12160 + 830 = 12990
14	15,320 + 1,215 = 16535
16	18,720 + 1,640 = 20,360
18	22,390 + 2110 = 24,450
20	26,160 + 2615 = 28,775
22	30,180 + 3,155 = 33,335

SURCHARGE H_T = 20.5' to PASS Q_{P1}

$$STOR_1 = \frac{7.5(20.5)12}{40,600} = .05''$$

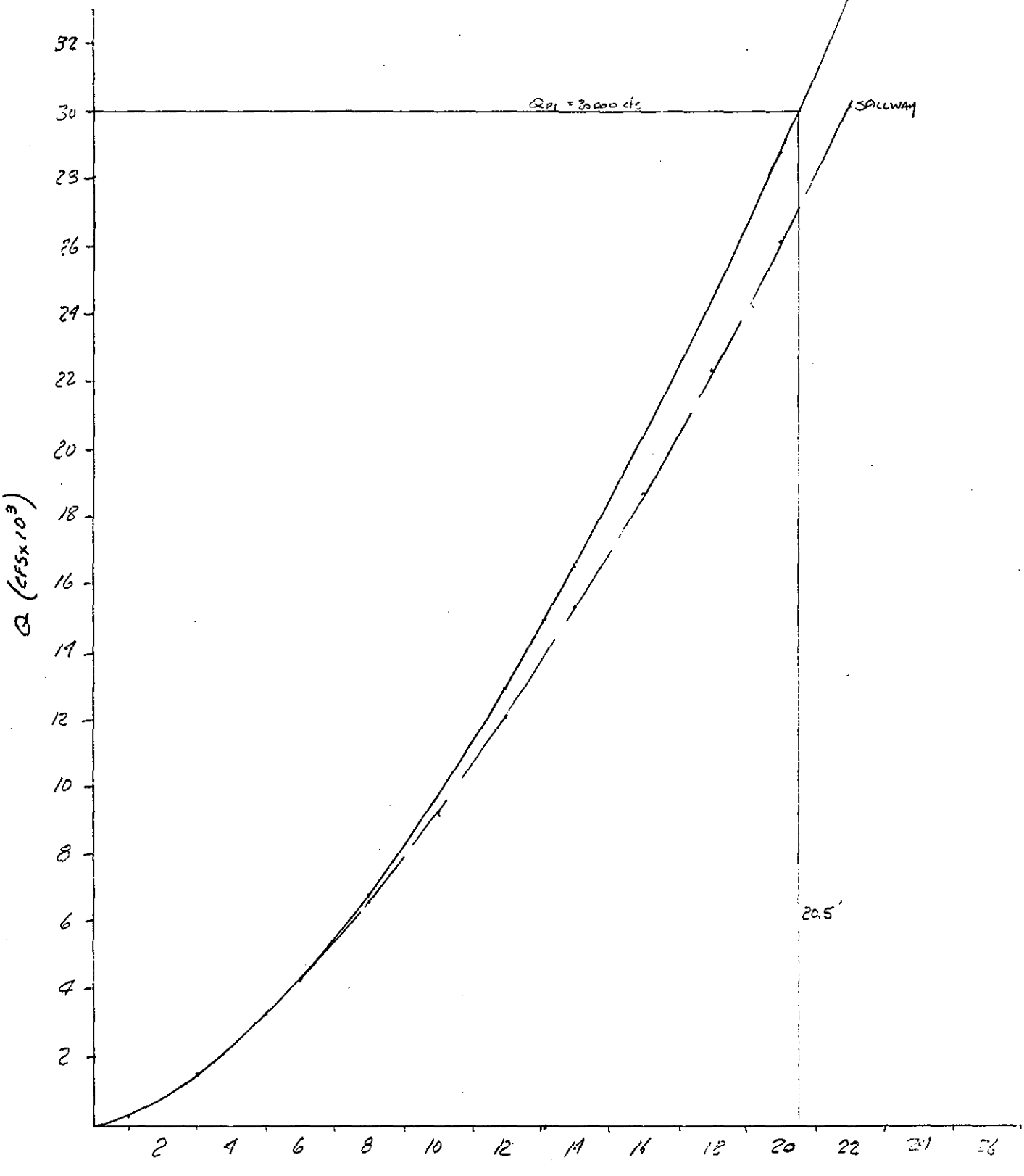
NEGLECT STORAGE.

Q_{P3} = 30,000 cfs. = PEAK OUTFLOW

Client COE Job No. 1345-065 Sheet 2 of 6

Subject SIRVENS POND By J. VEITCH Date 8 AUG. 1978

Ckd. Rev.



Client Corps Job No. 1345-065 Sheet 3 of 6

Subject STEVENS POND By J. Veitch Date 8 AUG. 1978

Ckd. Rev.

PEAK FAILURE OUTFLOW $Y_o = 15'$ $W_b = .3(90) = 27'$

$$Q_{p1} = \frac{8}{27}(27)\sqrt{32.2}(15)^{1.5}$$

$$= 2640 \text{ CFS.}$$

DOWNSTREAM DISCRIPTION: 10 x 50' LINED CHANNEL ALONG two Factory buildings with parking lot + MORE buildings on other. 600' DOWNSTREAM: BROADWAY STR. BRIDGE. (75 x 2' opening)

CHANNEL CAPACITY: FLOWING FULL $A = 500\ \square'$ $n = .03$
$S = .002$ $WP = 70'$

$$Q = \frac{1.49}{.03}\left(500\right)\left(\frac{500}{70}\right)^{.67}\sqrt{.002} = 4,150 \text{ CFS}$$

$$Y = 5.3'/\text{sec.}$$

PEAK FAILURE OUTFLOW CONTROLLED WITHIN CHANNEL - BRIDGE OPENING WILL HANDLE FLOW.

CRITICAL CONDITION: PEAK FLOW 30,000 CFS.

ASSUMING CHANNEL @ 4150 CFS USE 25,850 through NATURAL CHANNEL FOR APPROX. DEPTH.

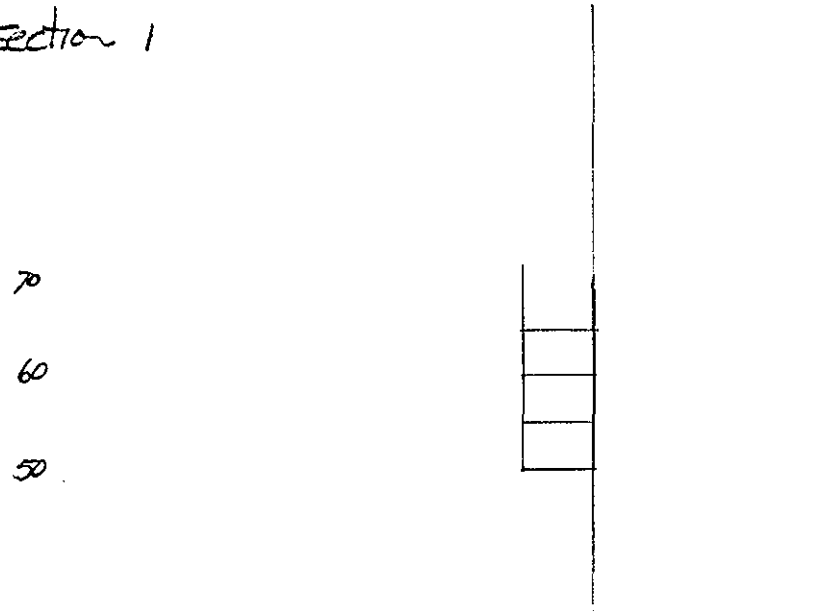
Client C of E Job No. 1345-065 Sheet 4 of 6

Subject STEVENS POND By J. VEITCH Date 3 AUG. 1978

Ckd. Rev.

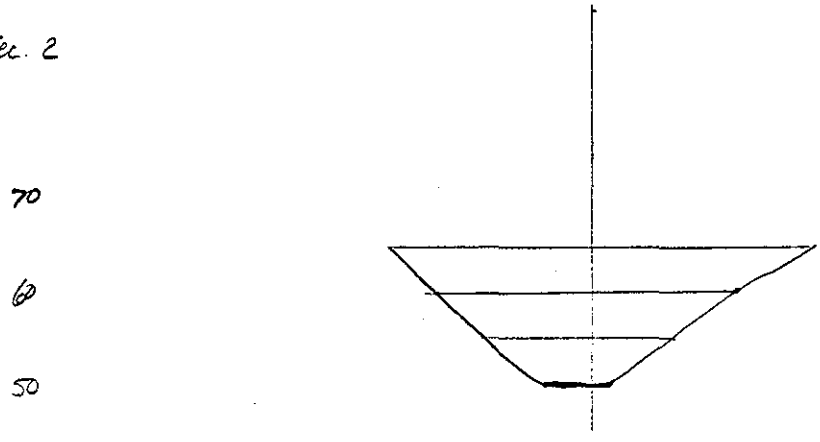
Section 1

1" = 400' —
1" = 20 ↑



L = 600'

Sec. 2



I.		A.	W.P.
	55	750	160
	60	1500	170
	65	2250	180

II.		A.	W.P.
	55	1350	400
	60	3925	630
	65	7750	900

REACH I

$S = .002$

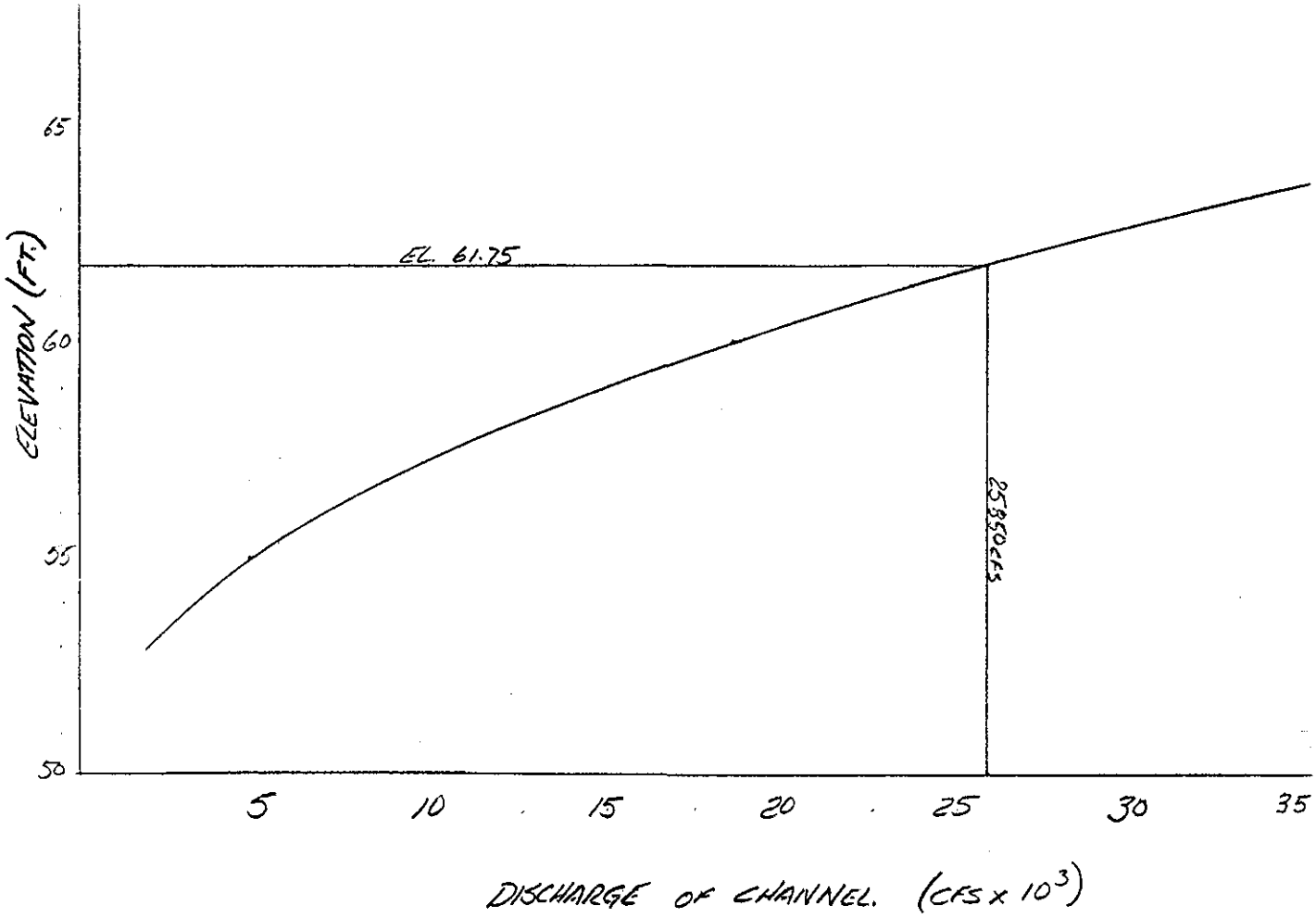
$n = .035$

EL.		Q (CFS)
55	$Q = \frac{1.49}{.035}(1050)\left(\frac{1050}{290}\right)^{.67}\sqrt{.002}$	= 4850
60	$= \frac{1.49}{.035}(2712)\left(\frac{2712}{400}\right)^{.67}\sqrt{.002}$	= 18615
65	$= \frac{1.49}{.035}(5000)\left(\frac{5000}{540}\right)^{.67}\sqrt{.002}$	= 42290

Client C OF E Job No. 1345-065 Sheet 5 of 6

Subject STEVENS POND By J. VEITCH Date 3 AUG. 1978

Ckd. Rev.



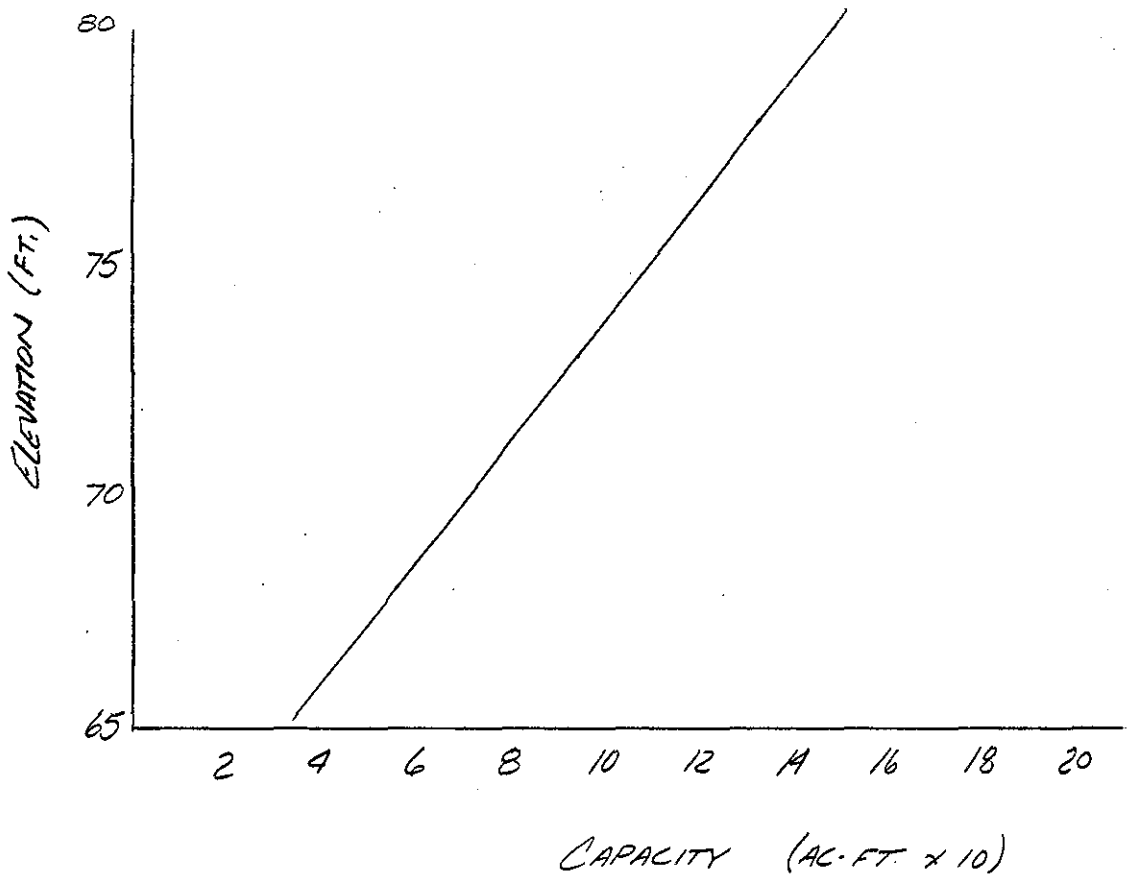
REACH I Q = 25850 CFS. EL. 61.75

RESULTS IN FIRST REACH DISASTROUS - EXTREME FLOODING THROUGH FACTORY AREA - OVER BROADWAY INTO RESIDENCIAL AREA. LARGE HAZARD TO LIFE

Client C OF E. Job No. 1345-065 Sheet 6 of 6

Subject - STEVENS POND - By J. VEITCH Date 22 AUG. 1978

CAPACITY CURVE. Ckd. Rev.



APPENDIX E